Chapter Seven – Indirect and Cumulative Effects Analysis

INDIRECT AND CUMULATIVE EFFECTS ANALYSIS

7.1 Indirect and Cumulative Effects Purpose and Background

7.1.1 Purpose of Indirect and Cumulative Effects Analyses

The purpose an *Indirect and Cumulative Impacts Assessment* is to present an evaluation of the reasonably foreseeable potential indirect and cumulative impacts expected as a result of this project, taking into consideration the socioeconomic, ecological, and cultural/historic and archaeological resources of the project area.

7.1.2 Alternatives Under Consideration

Eleven Build Alternatives are being considered as locations for potential I-66 Somerset to London alignment options, in addition to a No Build alternative in the area. This segment of the I-66/Southern Kentucky Corridor extends eastward from the proposed Somerset Northern Bypass in Pulaski County, through a portion of the Daniel Boone National Forest, to I-75 south of the existing KY 80/I-75 interchange in Laurel County, Kentucky. This facility, in combination with the Somerset Northern Bypass will provide a 4-land divided highway link between I-65 to the west and I-75 to the east. A brief description of each alternative is provided below. Locations of these eleven Build Alternatives are shown at the end of Chapter 3.

Alternative B - Alternative B begins at the proposed Somerset Northern Bypass and extends eastward along the southern part of the project area. Approximately 3,500 feet east of KY 692 the alignment shifts north, crossing KY 1003 and KY 80. Alternative B then parallels KY 80 to the north before shifting back and crossing the Rockcastle River at the existing KY 80 bridge location.

Alternative D - Alternative D begins at the proposed Somerset Northern Bypass and extends eastward along the southern part of the project area. This alternative continues eastward at approximately 4,000 feet to the south of KY 80, crossing KY 1003 and Buck Creek, before turning north to cross KY 1675. From this point, Alternative D continues east again, where it ties into KY 80 to cross the Rockcastle River at the existing KY 80 bridge location.

Alternative B-D - Alternative B-D is a combination of alignment Alternatives B and D. Alternative B-D begins at the proposed Somerset Northern Bypass and extends eastward following Alternative B until it crosses existing KY 80 near the intersection with Price Valley Road. From this point Alternative B-D extends southerly where it ties into Alternative D west of the crossing with Wadkins-Arthur Road. Alternative B-D then follows Alternative D and ties into existing KY 80 to cross the Rockcastle River at the existing KY 80 bridge location.

KY 80 Shifted - Alternative KY 80 Shifted begins at the proposed Somerset Northern Bypass and extends eastward to the existing intersection of KY 80 and KY 461. From this point eastward, Alternative KY 80 Shifted utilizes existing KY 80 as a frontage road for the remainder of the alternative. Alternative KY 80 Shifted continues east until approximately 4000' east of Tommy Rock Church Road where it ties into existing KY 80 to cross the Rockcastle River at the existing KY 80 bridge location.

KY 80 Modified - Alternative KY 80 Modified begins at the proposed Somerset Northern Bypass and extends eastward to the existing intersection of KY 80 and KY 461. From this point eastward, Alternative KY 80 Modified utilizes existing KY 80 as part of the proposed interstate facility. For access, a frontage road parallel, and to the north of this alternative, is proposed. Alternative KY 80 Modified crosses the Rockcastle River at the existing KY 80 bridge location.

Alternative K - Alternative K begins at the proposed Somerset Northern Bypass and extends eastward along the southern part of the project area. At Doolin Knob, Alternative K turns north and extends to existing KY 80. From this point eastward, Alternative K utilizes existing KY 80 as part of the proposed interstate facility. Alternative K crosses the Rockcastle River at the existing KY 80 bridge location.

Alternative G - Alternative G begins at the existing KY 80 Bridge crossing of the Rockcastle River. It extends east utilizing existing KY 80 for approximately 3 miles before turning and continuing southeast and tying into I-75 at the eastern project terminus.

Alternative H - Alternative H begins at the existing KY 80 Bridge crossing of the Rockcastle River. It extends east utilizing existing KY 80 for approximately 1.5 miles before turning and continuing southeast and tying into I-75 at the eastern project terminus.

Alternative I - Alternative I begins at the existing KY 80 Bridge crossing of the Rockcastle River. It extends east utilizing existing KY 80 for approximately 0.5 miles before turning and continuing southeast. It crosses KY 192 north of Cold Hill Road before tying into I-75 at the eastern project terminus.

Alternative L - Alternative L begins at the existing KY 80 Bridge crossing of the Rockcastle River. It extends east utilizing existing KY 80 until the intersection with KY 1535. From this point the alternative turns south and crosses Sinking Creek. After crossing Sinking Creek Alternative L turns southeast and continues to a tie-in with I-75 at the eastern project terminus.

Alternative M - Alternative M begins at the existing KY 80 Bridge crossing of the Rockcastle River. It extends east utilizing existing KY 80 until approximately Gregory Lane. From this point is turns and continues southeast to a tie-in with I-75 at the eastern project terminus.

No Build - The No Build Alternative consists of continued use of the existing roadway network and only of maintenance of existing facilities and systems as well as near-term improvements scheduled for implementation for which funding has been committed (near-term projects included in the KYTC FY 2005 – 2007 Statewide Transportation Improvement Program [STIP], the KYTC FY 2005 - 2010 Six-Year Highway Plan [SYP], or the KYTC 1999 Statewide Transportation Plan [STP]).

7.1.3 Definition of Direct, Indirect and Cumulative Impacts

By United States Code of Federal Regulations (CFR) definition, *direct effects (or impacts)* are caused by the action and occur at the same time and place (40 CFR § 1508.8). *Indirect effects (or impacts)*, are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8). *Cumulative effects (or impacts)* are impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7).

7.1.4 Scope of Indirect and Cumulative Impacts

An analysis of indirect and cumulative impacts for a project of this nature involves an assessment of the direct and indirect environmental effects of the proposed action, and a discussion of incremental, resource-specific impacts when considering *other past, present and reasonably foreseeable future actions*. Specifically, this consists of: 1) an identification of the environmental resources and features directly and indirectly impacted by the project, as determined in in-depth environmental base studies completed for this study, 2) an identification of other past, present and foreseeable future actions that have impacted (or will impact) the resources affected by the project, 3) an identification of appropriate geographic and temporal limits for the analysis, and 4) an assessment of cumulative impacts on resources affected by the project when considering resource conditions and all relevant past, present and future actions.

7.2 Summary of Direct and Indirect Project Impacts

7.2.1 Direct Project Impacts

The term "direct impact" is defined in section 7.1.3. For this project, expected direct impacts to environmental resources and features by each of the alternatives under consideration are summarized in the project Draft Environmental Impact Statement and associated environmental base studies completed as part of that study, including *Air Quality Impact Analysis* (HMB, November 2004), *Highway Traffic Noise Impact Analysis* (HMB, January 2005), *Terrestrial and Aquatic Baseline Report* (HMB, February 2005), *Socioeconomic Impact Analysis* (HMB, October 2004), *Karst and Geohazards Study* (Gannett Fleming and HMB, December 2004), *An Archaeological Survey* (Cultural Resource Analysts,

Inc, October 2004), *Aquatic Resources (Stream) Assessment* (Balke American, July 2004), *Historic Structures Inventory and Cultural Historic Survey* (Wilbur Smith Associates, December 2002), *Phase IB Report of a Historic Structures Inventory and Cultural Historic Survey* (Wilbur Smith Associates, March 2005), and *Hazardous Materials and Underground Storage Tank Survey* (HMB, October 2004) (see References in Appendix A for complete base study titles).

7.2.2 Indirect Project Impacts

The term "indirect impact" is defined in Section 7.1.3. When weighing the potential for secondary development related to construction of this proposed project, and the impacts that can reasonably be expected to occur as a result, several factors must be considered including: 1) existing and future transportation and access conditions, 2) current and future predicted population and population growth and 3) current and future development activities. Factors affecting indirect project impacts are further discussed, below.

1. Existing and Future Transportation and Access Conditions

Existing Conditions

In the vicinity of the project, the existing transportation network consists of I-75, US 27, KY 461 as the main north – south routes, and existing KY 80, KY 192, KY 1956 as the main east – west routes. The remainder of the local roadway network consists of two lane state routes and local roads. Access points in the Daniel Boone National Forest are limited to Forestry Service access and maintenance roads, and a few private driveways off of existing KY 80. Residential driveways, commercial driveways and agricultural field drives all directly connect to existing KY 80 and adjacent side roads in the project area. All side road intersections with existing KY 80 are currently at-grade.

Future Conditions

The proposed I-66 Somerset to London project is being planned as a four lane, divided, limited access facility. Access to and from the proposed new facility is expected to be controlled through a limited number of interchanges (six total) planned for the project, three in Laurel County and three in Pulaski County, at the following locations: 1) KY 80/US 461, 2) KY 1675, 3) KY 1675/KY 1956, 4) KY 80/KY 1956, 5) KY 192, and 6) I-75. The same numbers of interchanges are planned for the project regardless of alternative. The improved highway facility is expected to be located either on portions of or adjacent to existing KY 80. Other portions of existing KY 80 and much of the adjacent local roadway network are expected to be preserved and maintained for local area access purposes.

A number of transportation improvement projects that are included in the state transportation planning programs have been initiated within, and in close proximity to the cities of Somerset and London. All of these planned projects are located beyond the western and eastern termini and outside of any of the Build Alternatives proposed for this project. Many of these projects have been planned in conjunction with development occurring in and around the cities of Somerset and London, and several of the transportation projects will link to and extend the proposed I-66 Somerset to London project at some time in the future are shown in figure 7.2.2-1.

In addition, several other segments of the I-66/Southern Kentucky Corridor are under varying degrees of project development, including I-66 between US 23/US 119 south of Pikeville to the King Coal Highway, West Virginia (FHWA approved Record of Decision, 2003; awaiting schedule for final design), and the I-66 Ballard/McCracken Segment and I-66 Warren/Edmonson Segment (both in the early corridor development phases). These planned future projects, along with upgrading sections of existing I-66, will eventually complete the I-66/Southern Kentucky Corridor, tying this west-east facility across the state to key north-south interstates in the area, including I-55 (just across the Missouri line), I-65, I-75 and I-77 (in West Virginia).

2. Current and Projected Population

According to the Kentucky Cabinet for Economic Development (KCED, April 2005), the 2000 population of Pulaski County was 56,217 persons, of which 34,006 (60.5%) resided in rural areas and 22,211 (39.5%) resided in urban areas. In Laurel County, the 2000 population was 52,715 persons, 35,588 (67.5%) of which resided in rural areas and 17,127 (32.5%) of which resided in urban areas.

Recent trends in Pulaski and Laurel Counties indicate an increase in population (KCED, April 2005). From 2000 to 2003, the population of Pulaski County was estimated to have grown 3.2% (from 56,217 to 58,013 persons), and the City of Somerset, the largest community in Pulaski County, was estimated to have experienced a 3.8% increase in population for the same time period (11,352 to 11,786 persons).

Table 7.2.2-1 Planned Transportation Projects in the Vicinity of Somerset and London

Route	Project Phase	Description	Location	State Planning Program[1]
Somerset Northern Bypass (I-66)	Construction	New route from Louie B. Nunn Parkway to KY 80 to connect to proposed I-66 Somerset to London Segment	Somerset	SYP, STIP
US 27	Construction	Major widening from KY 80 at Somerset north to KY 70	Somerset	SYP, STIP
Somerset Southwest Bypass	Right-of-Way	New route from Louie B. Nunn Parkway to US 27	Somerset	SYP, STP, STIP
Somerset Southeast Bypass/KY 914	Planning	Major widening of the KY 914 from KY 769 north to KY 80	Somerset	STP
HR 9006/DB 9006		Pavement rehabilitation	London	SYP, STIP
KY 80	Design	Realign intersection From MP 13.93 to MP 14.24	Laurel County/London	SYP, STIP
I-75	Portions Under Construction	Major widening of I-75 in Laurel County/London	Laurel	SYP, STP
US 25 from London to Corbin	Scoping	Scoping study for 10.5 miles of improvements of US 25 from London to Corbin	London	STP
New Interstate-type Facility	Proposed (This EIS)	Connect proposed I-66 Somerset to London to the Daniel Boone Parkway	Laurel County/London	STP Illustrative listing
Daniel Boone Parkway	Proposed	Upgrade Daniel Boone Parkway to an interstate-type facility to connect to proposed I-66	Laurel County/London	STP Illustrative Listing

[1] SYP = KYTC FY 2005-2010 Six Year Plan; STIP = KYTC 2005-2007 Statewide Transportation Improvement Plan; STP = KYTC 1999 Statewide Transportation Plan (long range, 20-year plan); STP Illustrative Listing = projects that will move forward when special project-specific funding is approved.

The 2003 estimated population of Laurel County grew by 5.3% from 2000 (from 52,715 to 55,488 persons). In the same time period, the City of London, the largest community in Laurel County, grew 34.5% (from 5,692 to 7,653 persons). According to KCED (April 2005), the 2030 population for Pulaski and Laurel Counties is projected to be 75,092 (33.5% increase from 2000) and 85,088 (61.4% increase from 2000), respectively.

3. Current and Future Development Activities

Current and foreseeable future development patterns in the area were evaluated from review of available local zoning, land use, and information published by two Kentucky Area Development Districts (ADDs): the Lake Cumberland Area Development District (LCADD) which includes Pulaski County, and the Cumberland Valley Area Development District (CVADD) which includes Laurel County. Existing and planned land use information within the Daniel Boone National Forest was obtained from the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004).

Overall, review of this information indicates that the generalized pattern of development in the vicinity of the proposed I-66 Somerset to London project has been as follows:

1) Limited development in the area between Somerset and London, i.e., along the Build Alternatives proposed for the project, due in part to the occurrence of the Daniel Boone National Forest (in which development is restricted) and topographic limitations/constraints, and

2) A concentration of residential, commercial and industrial development, and growth, in and immediately surrounding the cities of Somerset and London.

These patterns of development are further discussed below.

Current Development

Current Development Along Proposed Project Corridor

No county-wide land use plans are currently in effect for either Pulaski Counties or Laurel Counties. In general, limited development is occurring in the area between Somerset and London due in part to occurrence of the Daniel Boone National Forest (where development is restricted), as well limitations set by the natural topographic conditions (rugged terrain) characteristic of the area. About half of the study area occurs in mostly undeveloped, relatively inaccessible forest lands within the mapped boundaries of the Daniel Boone National Forest (with an estimated 20% to near 50% of the project length occurring in actual national forest holdings, depending on the alternative). Beyond the forest boundaries the project area is comprised of scattered agricultural, residential and commercial land uses. Small communities and rural residential land uses in the project area are mostly confined to flatter surface stream bottomlands and agricultural lands located in the western and eastern most portions of the project area in Pulaski and Laurel Counties. Bottomlands are also the primary location for the majority of the local road network, including much of existing KY 80. A limited amount of agricultural land and a minimal amount of commercial land is also found in the project area, and no substantial new residential development activities (such as subdivision construction) are known to be currently underway in the project area. A regulated amount of prescribed timber harvesting for the purposes of regenerative treatment, thinning and maintenance, in areas suitable for timber production, is taking place in a limited number of locations within the Daniel Boone National Forest, under guidance of the United States Forest Service, and in accordance with the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004). Due to the nature of this activity, however, and because it is not widespread, it is not considered a developing industry within the immediate project area. See following item Future Development for a discussion of the Daniel Boone National Forest Management Plan.

Current Development In and Around Somerset and London

At the time of this report, development is primarily occurring west and east of the project area, outside of the boundaries of the proposed project Build Alternatives, along KY 461 in the vicinity of the City of Somerset in Pulaski County, and, within Somerset, mostly along US 27. Development is also occurring along existing KY 80, KY 192 at I-75, and along US 25 in the City of London in Laurel County (based on aerial photo review and reconnaissance field inspection). Substantial tourism related commercial development is also currently occurring along US 27 within the City of Somerset, and along KY 80 and KY 192 at I-75 in the City of London (CVADD 2002 and 2003, and LCADD, 2003 and 2004). This development in Somerset and London is already occurring and is expected to occur with or without the proposed project.

Based on a review of commercial and industrial development information from the Kentucky Cabinet for Economic Development for Pulaski and Laurel Counties (April 2005), recent business growth in both counties, particularly in and around the cities of Somerset and London, has been increasing since 2002, as 23 business relocations/expansions are reported for Somerset/Pulaski County during that time and 14 business relocations/expansions are reported for London/Laurel County during that timeframe. At this time, areas of commercial and industrial development are occurring within a number of trade/light manufacturing industrial and technology parks located beyond the project termini (and outside the project limits) in proximity to the cities of Somerset and London. Industrial and technology parks are being developed east of the City of Somerset along US 461 in the Valley Oak Commerce Complex and Northstar Technology Park in Pulaski County and west of the City of London along Industrial Park Boulevard off of existing KY 80 in Laurel County, as described in the project socioeconomic study (HMB, July 2002).

Future Development

Future Development Along Proposed Project Corridor

A revised land use management plan was developed by the United States Forest Service and approved for implementation on the Daniel Boone National Forest in April 2004. The *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004) is organized around the forest's biological, physical, and social resources, and states that it is designed to incorporate a sustainable mix of desired uses, valued characteristics, and services, in order to provide long-term benefit to local communities and the broader public. As part of the plan, it is expected that renewable products such as timber and medicinal plants will be harvested on a sustainable basis. In addition, federal mineral resources will also be developed taking into account the most practicable and prudent conservation methods, in order to simultaneously accommodate the rights of private mineral owners while protecting other valuable forest resources. The Forest Management Plan also ensures that habitat is available to sustain recreational wildlife pursuits such as viewing, photographing, hunting, and fishing.

The revised Forest Management Plan ensures the maintenance of forest health and accessibility of resources by providing for maintenance of the current forest road system. Maintaining the current forest road system will guarantee adequate access for both public and Forest Service purposes while ensuring minimal damage to resources, since most forest roads are rough and irregular with native surfacing. Maintenance activities on most forest roads are expected to provide for occasional and essential access for limited public passage or for the purposes of resource protection, and not for sustained or continual use. The Forest Management Plan also states that it will limit and restrict public access on some forest roads, either seasonally or permanently in ecologically sensitive areas, and new road construction is planned to be kept to a minimum (USFS, April 2004).

Detailed information concerning specific methods and applications concerning forest uses, and additional preservation, conservation and maintenance prescriptions are described in the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004).

Future Development In and Around Somerset and London

At this time, no county-wide zoning or adopted existing or future land use plans exist for either Pulaski or Laurel Counties, or the project area (CVADD 2002 and 2003, and LCADD, 2003 and 2004). However, a 1994 draft version of a comprehensive plan for Laurel County is in the process of being updated by the London-Laurel County Joint Planning Commission. A land use plan has been developed for the City of Somerset; however, no land use plan is in place for the City of London.

Based on these sources, the City of Somerset has planned commercial development along US 27, mostly in support of area tourism industry. Some industrial

development is also being planned in and around Somerset (personal communication with City of Somerset, City of Somerset Future Land Use Map, April 2004). According to mapping in the Lake Cumberland Area and Cumberland Valley Development District Plans for Pulaski and Laurel Counties, existing and future water lines are planned throughout both counties (including portions of the project area), though existing and planned sewer service is not widespread, and primarily located in and around population centers (Somerset and London). These planned development and infrastructure improvements are expected to occur whether or not the proposed project is constructed.

7.2.3 Conclusions Regarding Indirect Impacts

Based on the information described above, reasonable conclusions regarding indirect impacts by the project include the following:

1) Secondary development and associated impacts as a result of the proposed project are expected to be limited, and, where they do occur, to be concentrated around proposed interchange locations due to the following:

- the project will be constructed as a limited access facility, where access to and from the new highway will only be provided at planned interchanges (no access points along the new highway facility will be granted to landowners, businesses or developers),
- development is limited in the area between Somerset and London due in part to occurrence of the Daniel Boone National Forest (where development is restricted), as well limitations set by the natural topographic conditions (rugged terrain),
- no other new transportation facilities or related major upgrade projects are planned in the area between Somerset and London that, along with this project, would result in substantial future development in the immediate area,
- no specific zoning, future land use plans, or coordinated utility improvements are in place in the area along the proposed project that indicate planned efforts for development, and
- no additional business parks, industrial sites or industrial buildings (other than those noted in Section 7.2.2 [subsection 3]) are identified in current Development District or other available local plans to indicate substantial expansion or new business location.

2) Ongoing development is expected to continue to be concentrated in and around the cities of Somerset and London, west and east of the project termini. Development in these areas (primarily tourism and service-related industries) is expected to occur whether or not the proposed project is constructed[1]. The proposed project, however, in providing linkage and improved travel efficiency between the two cities, will likely benefit development in these areas by providing more efficient movement of goods, materials, labor force and tourists. However, without adopted land use plans or economic studies, it is not possible at this time to make a reasonable prediction of the extent or specific location of potential growth and development in and around these two cities, nor what associated impacts can be directly attributed to the implementation of the proposed project.

7.3 Cumulative Impacts

7.3.1 Relevant Past, Present and Future Actions

A key component of a cumulative impacts analysis is the identification of relevant past, present and future actions which have played, or will play, a substantive role in the accumulation of incremental impacts to environmental resources and features in the project area. These actions are summarized below.

[1] For example, much of the development occurring in London and Somerset is based on the services and tourism industries linked to the abundance of recreational opportunities in close proximity, such as Lake Cumberland, Dale Hollow Lake, Green River Reservoir and the Daniel Boone National Forest. Growth and development in this area is already occurring, not only due to the availability of tourism related employment, but also the demand for second/seasonal homes located to more easily access the area's numerous recreational opportunities (LCADD 2003 and 2004).

Past Actions

Past actions that have affected the environmental resources and features in the project area include roadway construction, scattered single family residential and farm property development, logging, and to a lesser extent, mining. Urbanization, tourism and associated development have affected resources to the west and east of the project termini in the Somerset and London vicinities.

Road construction relevant to this analysis includes establishment of the modern existing local road network (particularly I-75, US 461, KY 692, KY 1003, KY 1675, KY 1956, KY 192, and KY 363), as well as existing KY 80, which generally parallels KY 1675 and KY 1956 throughout most of the project area. Existing KY 80, between Somerset and London, Kentucky is an extension of the Cumberland Parkway. Its construction and subsequent opening to traffic in the early 1980's followed the prior establishment of much of the modern state highway and local road network. Based on aerial and map reviews and field observations, much of the scattered single family residential and farm property development along adjacent state highways, and to a lesser extent along local roadways in adjacent drainages or "hollows" in the project area took place in this same general time frame.

With the exception of a few inaccessible deep valley cuts, forest lands in Pulaski and Laurel Counties have been extensively logged since the 1800's as a result of individual and commercial operations, and therefore, little of the original, pre-settlement forest still exists today. However, most of the region has reforested and matured over the years, and consequently, periodic logging still continues throughout the region. Field observations and map reviews of woodlands in the project area show evidence of past (and recent) logging in the form of haul road networks, tracts of young/thin forest, and stumps. Currently, a regulated amount of prescribed timber harvesting for the purposes of regenerative treatment, thinning and maintenance, in areas suitable for timber production, is taking place in a restricted number of locations within the Daniel Boone National Forest, under guidance of the United States Forest Service and in accordance with the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004). Due to the nature of this activity, however, and because it is not widespread, it is not considered a developing industry within the immediate project area. See item 7.2.2 (subsection Future Development) on previous page, for a discussion of the Daniel Boone National Forest Management Plan.

Though an exact timeline for the progression of farming activities in the project area is not known, it is likely to have coincided with settlement of the area, and expanded with the establishment of the modern local road network in the early to mid-1900's. To some extent, farming has been conducted in the area along the proposed project Build Alternatives since settlement times. However, most of the project area consists of steeply-sloped woodlands; thus, the amount of land available for farming is limited. Based on aerial and map review and field observations, a relatively small amount of land is currently available along the proposed project corridor which could be converted to new farmland, as small pastures and croplands, residential properties and roadway corridors have already utilized most of the farmable land (bottomland) in the area.

According to information published by the Kentucky Geological Survey (KGS, April 2005), sporadic underground and surface coal mining activities have been taking place in Laurel Pulaski and Laurel Counties since the early 1800's, though extensive production and the emergence of surface mining did not become established until after 1940. To date, over 18 million tons has been mined from Pulaski County and over 35 million tons of coal has been mined from Laurel County. Coal production peaked in Pulaski County around 1980 and peaked in Laurel County around 1970. According to KGS, coal production ceased in Pulaski County in 1992, but continues on a very small scale in Laurel County, and no coal mines are currently in operation in the project area, or in the vicinities of Somerset or London.

Two aggregate mining operations (quarries), however, were observed and/or noted from aerial mapping as occurring in Pulaski County in the project area. One is located along KY 1003 and the other west of the intersection of KY 80 and KY 1956

According to materials published by the Somerset Community College and the Kentucky Court of Justice (SCC and KCOJ, respectively, May 2005), residential, commercial and industrial development, in general, began in the cities of Somerset and London in the mid

to late nineteenth century, and expanded more rapidly following establishment of much of the local area railroad network between 1870 and 1880. Construction of local area railroads precipitated establishment of a number of industries in both cities. The City of Somerset, in particular, developed extensive industries centered on the manufacture and maintenance of parts and materials for steam locomotives, in addition to industries related to the manufacture of hardwood products, furniture, and carriage and buggy materials. Construction of US 27 in the 1930's and KY 80 in the 1980's in Somerset, and KY 80 and US 25 in the 1920's and I-75 in the 1960's in London, further encouraged industrial and commercial development as the movement of goods and materials shifted from railroad to heavy truck transport. By the mid-twentieth century, area industries included the production of textiles, wood furniture, vitreous china and sanitary ware, automobile seats and springs, dairy products and pressed glassware. Kentucky 80, which connects communities in Pulaski, Laurel and Russell Counties, opened coal fields within these areas and further encouraged growth of the work force and population in these two cities.

It is reasonable to assume that historic residential, commercial and industrial development within the cities of Somerset and London, from settlement times to the present, has resulted in the loss and degradation of terrestrial and aquatic natural resources. Quantification and determination of specific impacts to these resources historically occurring within Somerset and London, however, is indeterminable, generally due to the limited availability of detailed information concerning the occurrence and quality of these resources in the area, until recently.

Present Actions

Present actions that are affecting environmental resources and features in the project area include: 1) on-going residential, commercial and industrial development and transportation improvements in and immediately surrounding the cities of Somerset and London, 2) continued local road maintenance activities (ditch clearing and mowing, pavement repair, salting, etc.), 3) limited amounts of regulated commercial logging for forest thinning and maintenance activities in accordance with the Daniel Boone National Forest Management Plan, and 4) limited amounts of agricultural farming activities. Description of these current actions is presented in Section 7.2.2.

Reasonably Foreseeable Future Actions

Description of expected future development in and around the cities of Somerset and London, and in proximity to the area along the proposed project is presented in Section 7.2.2 (subsection 3, Future Development). In summary, secondary development related or directly attributable to construction of this project is expected to be limited due to a combination of factors, including: proximity of the Daniel Boone National Forest (where development is restricted), natural topographic limitations set by steep terrain, and planned limited access for the proposed I-66 facility. Relevant future actions in the project area foreseeable through the 2030 design and planning horizon include continued maintenance of the local road network (and the proposed I-66 facility), scattered single family residential and farm property activity and development outside the boundaries of the Daniel Boone National Forest, logging, and potential commercial development (service related) concentrated near proposed interchange locations.

As discussed in Section 7.2.2, development is expected to continue and be concentrated in and around the cities of Somerset and London, whether or not the proposed project is constructed. The proposed project will improve linkage between the two cities, and will likely benefit development in these areas by providing more efficient movement of goods, materials, labor force and tourists.

7.3.2 Cumulative Impacts Analysis

The term "cumulative impact" is defined in Section 7.1.3. The analysis of cumulative impacts for environmental resources and features impacted by this project requires a resource-specific assessment of the collective impacts that have resulted from relevant past actions in the area and impacts that are expected to result from present and reasonably foreseeable future actions.

7.3.3 Geographical and Temporal Limits of Analysis

The geographic area used for this cumulative impact analysis consists of a corridor encompassing the maximum width of all eleven of the project proposed Build Alternatives for alignment options, and including the areas of proposed interchanges, plus the cities of Somerset and London at the west and east project termini (see figure 7-1 at the end of this chapter).

This geographic area is determined appropriate for the analysis in that: a) direct and indirect impacts are expected to be limited to the project corridor and proposed interchange areas due to development and access restrictions, existing topographic constraints, and other factors described in Section 7.2.3, and b) it includes the primary zone of expected benefit and influence of the project (i.e., the cities of Somerset and London).

In assessing past, current and future actions for the project area, a time period ranging from approximately *the early 1900's* (corresponding to the beginning of development/disturbance in the area from logging, farming, mining and urbanization in Somerset and London; see Section 7.3.1) *to 2030*, the design and planning horizon for the I-66 Somerset to London project was used. The cumulative impacts assessed take into account actions in this time frame that may have had or may one day have an effect on the resource being investigated.

7.3.4 Resource Specific Impacts

Based on review of the project base studies and relevant past, present and future actions in the project area, the resource specific cumulative impacts analysis for the I-66 Somerset to London is presented below.

Air Quality and Noise

According to the project air quality impact analysis (HMB, November 2004), Laurel and Pulaski Counties are currently in attainment for transportation related air pollutants. Also, according to the calculated existing and future emissions of CO, the proposed project is not expected to alter the attainment status of either county, or add to the pollutant burden of the Appalachian Intrastate and South Central Kentucky Air Quality Control Regions. All existing and predicted carbon monoxide concentrations are below the one-hour standard of 35 ppm and the eight-hour standard of 9 ppm. For Laurel, Pulaski and Rockcastle Counties, transportation control measures are not required pursuant to the Amended Final Conformity Guidelines, September 15, 1997. In addition, the proposed project is listed in the latest (October 2000) state transportation improvement program (Kentucky Statewide Transportation Improvement Program [STIP], Fiscal Years 2001-2006, Kentucky Transportation Cabinet) and is therefore considered to be in compliance with the Kentucky State Implementation Plan for the Attainment and Maintenance of National and State Ambient Air Quality Standards. The proposed I-66, Somerset to London, facility would not cause any violation of the National Ambient Air Quality Standards.

According to the project noise study (HMB, November 2004), between four and sixteen noise sensitive receptor locations depending on the alternative, are expected to experience noise levels that either exceed the applicable Noise Abatement Criteria or are substantially over existing levels (>10 dBA increase). Further feasibility/reasonableness studies for noise abatement will be performed once a preferred alternative is selected, as appropriate. Mitigation measures for temporary noise impacts expected during construction of the proposed project are addressed in the project noise report (HMB, November 2004).

The introduction of existing KY 80 and other roadways to the local environment has likely had some impact on local air quality and noise levels. Prior to construction of existing KY 80, the project area was located in a rural, generally natural setting, absent of persistent traffic noise and vehicle emissions, with the exception of generally light local road traffic and the temporary and sporadic operation of heavy equipment for residential and farm property development, logging and mining activities.

Present and future actions that may cumulatively affect air quality and noise levels in the project area include on-going residential and commercial development within the cities of Somerset and London (as described in Section 7.2.2 (subsection 3), and scattered single family residential and farm property development, logging, and limited and minor commercial development that may occur along the project corridor between the two cities, primarily concentrated around proposed interchange locations. These actions may result in minor localized noise and air quality impacts at these locations. Overall, analyses conducted for this project concluded that existing and predicted air quality is in compliance with state and federal standards, and that predicted future noise impacts will

be mitigated where determined to be feasible and reasonable in accordance with KYTC and FHWA guidelines.

Groundwater and Karst

In general, groundwater resources in the area are limited in Laurel County and occur extensively in Pulaski County due to the presence of karst (HMB, February 2005). According to the *Terrestrial and Aquatic Ecological Baseline Report* (HMB, February 2005), a total of 1,129 karst openings were identified in the project Build Alternatives in Pulaski County during surveys conducted for this project. Currently in the proposed project area, karst formations are being used extensively for groundwater use, with some minor use for the production of fossil fuels and the development of surface and underground aggregate mines (quarries).

Groundwater in karst terrain is considered to be vulnerable to contamination and varies in vulnerability according to the nature of the contaminant and karst features, the degree of contact of infiltrating water with the soil zone, and the opportunity for transported pollutants to enter the karst aquifer system. According to the terrestrial and aquatic study (HMB, February 2005), agriculture and industry may be the most significant sources of groundwater pollution in karst areas, and that highways are not major contributors of non-point source pollution of karst aquifers compared to other land uses. However, highway construction activities can have adverse effects on groundwater quality and aquatic organisms, particularly in karst areas when Best Management Practices are not properly employed (HMB, February 2005).

The majority of groundwater use in Pulaski County is through private water wells. Records indicate the presence of 938 wells and 148 springs in the County. However, only a few of the wells are noted as being used for public water supply. Approximately 285 wells and 115 springs are situated within the USGS 7.5 Minute quadrangles (Ano, Billows, Bobtown, Dykes, Shopville and Somerset) within the proposed project area, and no major aquifers or public water supplies were identified as occurring in the project area (HMB, February 2005).

It is expected that a number of karst openings will be directly impacted by the proposed project in Pulaski County, regardless of the alternative, due to the prevalence of karst formations throughout the general area. However, because this project is still in the early stages of development, it is expected that potential impacts to significant karst formations and groundwater resources can be avoided and/or minimized as alternatives are further developed and alignments defined. Impacts to these resources are considered to be mitigable. A detailed discussion of karst formations, hydrogeology and available groundwater resources of the region encompassing the I-66 project area, and mitigation of impacts resulting from the highway construction are discussed in detail in the project terrestrial and aquatic base study (HMB, February 2005) and in chapters 4 and 5 of this DEIS.

Past actions in the project area in Pulaski County that may have resulted in impacts to karst formations and groundwater resources include roadway construction, scattered single family residential and farm property development, logging, and to a lesser extent surface and underground aggregate mines (quarries).

Reasonably foreseeable future actions/development as a result of the project, which is expected to be limited and primarily concentrated at proposed interchange locations, will likely result in additional impacts to karst formations and groundwater resources in Pulaski County, and groundwater resources in Laurel County. Reasonably foreseeable future impacts to these resources are not quantifiable, but could include such impacts as eventual increases in turbidity and dissolved solids and/or the seepage of fuels, lubricants, fertilizers, herbicides/pesticides or other pollutant materials into unique karst habitats and groundwater. However, cumulative impacts to these resources in the project area are expected to be limited (or minor) along the proposed project corridor, and somewhat offset by the use of Best Management Practices and through mitigation as discussed in the project *Terrestrial and Aquatic Ecological Baseline Report* (HMB, February 2005).

Cumulative impacts to karst and groundwater resources in the cities of Somerset and London are generally less predictable. Continuing residential, commercial, industrial and roadway development in these areas (which is expected to occur whether or not the project is constructed) is likely to result in some level of karst and groundwater impacts. However, cumulative impacts to these resources in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Surface Streams

According to the terrestrial and aquatic base study (HMB, February 2005), the proposed project in Pulaski County is expected to result in the crossing of 18 to 23 surface streams, depending on the Build Alternative and alignment, and result in impacts to approximately 11,936 to 31,371 lineal feet of natural stream channel. In Laurel County, the proposed project is expected to result in the crossing of between 23 and 24 surface streams, depending on the Build Alternative and alignment, and result in impacts to approximately 18,616 to 21,238 lineal feet of natural stream channel. These impacts are expected to be primarily to Price Valley, Lacey Fork and Lacey Fork Tributary #1 in Pulaski County and to Pine Creek, Ward Branch and Little Laurel River in Laurel County. Habitat criteria for streams established by the Kentucky Department of Water indicates that of these six streams, only Lacey Fork Tributary #1 is "partially supporting" its designated uses, while the remainder are "not supporting" their designated uses per the Kentucky Department of Water (KDOW, July 2002). In general, most of the streams surveyed for this project were determined to be "not supporting" designated uses due to the presence of generally disturbed/degraded stream conditions throughout the project area. However, because this project is still in the early stages of development, it is expected that potential impacts to significant and valuable surface streams can be avoided and/or minimized as alternatives for this project are further developed and the alignments defined.

Past actions in the project area that may have in resulted in impacts to surface streams include development of the present-day local roadway network, including existing KY 80, riparian clearing mainly from stream-side farm property development and related activities, and degradation of water quality as a result of runoff from logging, residential and farm property development, and inefficient septic treatment.

Reasonably foreseeable future actions/development as a result of the project, which is expected to be limited and primarily concentrated at proposed interchange locations, and other development not associated with the project, will likely result in some additional impacts to surface streams. Reasonably foreseeable future impacts to these resources are not quantifiable, but could include such impacts as limited amounts of riparian clearing and continued water quality degradation from on-going roadway, bridge and culvert maintenance activities, scattered single family residential and farm property development, logging, limited and minor commercial development, and to a much lesser extent, surface and underground aggregate mines (quarries). Within the Daniel Boone National Forest, reasonably foreseeable future impacts to surface streams in the project area are expected to be less due to the application of riparian prescription areas and other conservation measures within the forest as approved in the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004). According to the United States Forest Service (April 2004), special considerations must be given to streams within the National Forest to prevent degradation of water quality and aquatic habitat through the preservation and protection of the riparian corridor. Cumulative impacts to surface streams in the project area are expected to be limited (or minor) along the proposed project corridor, and somewhat offset by mitigation options and permit requirements as discussed in the project *Terrestrial and Aquatic Ecological Baseline Report* (HMB, February 2005) and chapter 5 of this DEIS.

Cumulative impacts to surface streams in the cities of Somerset and London are generally less predictable. Continuing residential, commercial, industrial and roadway development in these areas, which is expected to occur whether or not the project is constructed, is likely to result in some level of surface stream impacts. However, cumulative impacts to this resource in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Floodplains

Federal Emergency Management Agency (FEMA) 100-year floodplain in the proposed project area occurs along Flat Lick Creek, Stewart Branch, Buck Creek and Line Creek in Pulaski County, and along the Rockcastle River, Sinking Creek and Little Laurel River in Laurel County. The proposed project is expected to encroach on between 4.9 and 58.8 acres of FEMA 100-year floodplain in Pulaski County and between 16.3 and

22.2 acres of FEMA 100-year floodplain in Laurel County, depending on the Build Alternative (HMB, February 2005). However, because this project is still in the early stages of development, it is expected that some of the potential impacts to 100-year floodplain can be avoided and/or minimized as alternatives for this project are further developed and the alignments defined. Additionally, any Build Alternative selected for construction for this project will require a FEMA "No Rise" Certification for the protection of current floodplain elevations and beneficial values, and flood studies and detailed hydraulic calculations needed to support a "No Rise" Certification will be conducted before final design and project construction. Impacts to floodplains can be mitigated, and will be evaluated as part of the 404/401 permit process. Additional information concerning mitigation options and required permits for impacts to FEMA 100-year floodplains are detailed in chapter 5 and the project *Terrestrial and Aquatic Ecological Baseline Report* (HMB, February 2005).

Field observations indicate that past floodplain encroachment within the proposed project area has occurred primarily as a result of scattered residential and farm property development and maintenance, and roadway construction. The majority of this encroachment has come in the form of vegetation removal, soil tilling, and grading, and to a lesser extent bank shaping, channeling and other riparian modifications.

Reasonably foreseeable future actions/development as a result of the project, which is expected to be concentrated at proposed interchange locations, and other development not associated with the project, will likely result in some additional impacts to FEMA 100-year floodplain. Reasonably foreseeable future impacts to 100-year floodplain are not quantifiable, but could include impacts related to continued residential and farm property maintenance and development that includes removal of vegetation, soil tilling and grading, and to a lesser extent bank shaping, channelization, and other riparian modifications. Reasonably foreseeable future impacts as a result of roadway construction are not expected as a FEMA "No Rise" certification would be required for any future transportation projects in the area.

Cumulative impacts to FEMA 100-year floodplain in the cities of Somerset and London are less predictable. Cumulative impacts to 100-year floodplain in Somerset and London are expected to include influences from residential, commercial and industrial development mainly as a result of vegetation removal, grading, and to a lesser extent bank shaping, channeling and other riparian modifications. However, cumulative impacts to this resource in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Wetlands

According to the terrestrial and aquatic base study (HMB, February 2005), a total of 461 wetlands were determined to occur in the proposed project area corridor. Depending on the Build Alternative, the project is expected to impact between approximately 4.1 and 10.5 acres of wetland in Pulaski County and between approximately 6.8 and 18.1 acres of wetland in Laurel County. Many of these wetlands are small, limited quality, emergent features that have formed along roadway ditches or at the base of existing KY 80 or other roadway embankments. The remainder are primarily bottomland features, most of which are of more moderate size and quality. However, because this project is still in the early stages of development, it is expected that potential impacts to wetlands can be avoided and/or minimized as alternatives for this project are further developed and the alignments defined. Impacts to wetland resources in the project area are considered to be mitigable, and will be further evaluated as part of the 404/401 permit process as the project further develops. Additional information concerning mitigation options and permit information required for impacts to wetlands are detailed in chapter 5 and the project *Terrestrial and Aquatic Ecological Baseline Report* (HMB, February 2005).

Past actions in the project area that may have in resulted in impacts to wetlands include development of the present-day local roadway network, including existing KY 80, draining and clearing mainly from farm property development and related activities, logging and mining. Based on field studies, most natural wetlands in the project area are found in locations that are generally undesirable for activities such as logging and surface and underground aggregate mines (quarries), and to some extent, residential and farm property development. Though it is presumed that some amount of wetland habitat was impacted as a result of past actions in the project area (since a large portion of existing KY 80 and adjacent local road network construction took place in bottomland locations or along existing stream corridors), the overall impact on project area wetlands is indeterminable.

Reasonably foreseeable future actions/development as a result of the project, which is expected to be limited and primarily concentrated at proposed interchange locations, and other development not associated with the project, will likely result in some additional impacts to wetlands. Reasonably foreseeable future impacts to these resources are not quantifiable, but could include such impacts as limited amounts of draining and clearing from on-going roadway, bridge and culvert maintenance activities, scattered single family residential and farm property development, logging, limited and minor commercial development, and to a much lesser extent, surface and underground aggregate mines (quarries). Within the Daniel Boone National Forest, reasonably foreseeable future impacts to wetlands in the project area are expected to be less due to the protections afforded these resources and in conservation measures outlined within the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004). Impacts to wetlands in the project area are not expected to be notable because any development that occurs is expected to be limited, minor and concentrated around proposed interchange locations for reasons outlined in Section 7.2.2 (subsection 3).

Cumulative impacts to wetlands in the cities of Somerset and London are generally less predictable. Continuing residential, commercial, industrial and roadway development in these areas, which is expected to occur whether or not the project is constructed, is likely to result in some level of wetland impacts. However, cumulative impacts to this resource in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Terrestrial Habitats/Woodlands

According to the terrestrial and aquatic base study (HMB, February 2005), the proposed project, regardless of alternative, will impact primarily semi-natural habitats, including upland and bottomland woodlands, wooded ravines, wooded riparian corridors, oldfields and mixed rangelands, as well as segments of existing roadway right-of-way, and relatively minor amounts of residential/commercial lands, cropland and pasturelands. Woodlands alone are expected to constitute approximately between 35 percent and 65 percent (400 to 600 acres) of the total land area required to construct the proposed project (HMB, February 2005). The remainder of the new right-of-way area needed to construct the proposed project is primarily in scattered single family residential, oldfield, herbaceous/shrublands and agricultural land uses. However, because this project is still in the early stages of development, it is expected that potential impacts to more sensitive terrestrial habitats and higher quality woodlands can be avoided and/or minimized as alternatives for this project are further developed and the alignments defined.

Nearly all of eastern Kentucky (including the project area) has been extensively logged since the 1800's. This has resulted in the removal of essentially all of the original hardwood forest in eastern Kentucky, including Pulaski and Laurel Counties. With the exception of a few inaccessible deep valley cuts, including a few in the project area, little of the original, pre-settlement forest still exists today. Field observations and map reviews of woodlands in the project area show evidence of past logging activities in the form of haul road networks, tracts of young/thin forest, and stumps. Reforestation, forest management and time, however, have left most of the region, and the area along the proposed project corridor, covered by young to intermediate-aged, diverse and steadily maturing woodland cover. In addition to logging, past actions in the project area that may have resulted in impacts to more sensitive terrestrial habitats and woodlands include development of the present-day local roadway network, including existing KY 80, clearing for residential and farm property development and related activities, and surface and underground aggregate mines (quarries).

Reasonably foreseeable future actions/development as a result of the project, which is expected to be limited and primarily concentrated at proposed interchange locations, and other development not associated with the project, will likely result in some additional impacts to terrestrial habitats and woodlands. Reasonably foreseeable future impacts to these resources are not quantifiable, but could include such impacts as limited amounts of clearing and habitat fragmentation from on-going roadway, bridge and culvert maintenance activities, scattered single family residential and farm property development, logging, limited and minor

commercial development, and to a much lesser extent, surface and underground aggregate mines (quarries). Impacts to more sensitive terrestrial habitats and higher quality woodlands in the project area are not expected to be notable because any development that occurs is expected to be limited, minor and concentrated around proposed interchange locations for reasons outlined in Section II.B.3, above. Within the Daniel Boone National Forest, reasonably foreseeable future impacts to woodlands in the project area are expected to be less due to the implementation of timber harvest controls, and the harvest of timber primarily for the purposes of regenerative treatment, thinning and maintenance in a limited number of locations under the guidance of the United States Forest Service as outlined in the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004). Due to the nature of this activity, however, and because it is not widespread, it is not considered a developing industry within the project area. See Section 7.2.2 (item Future Development), for a discussion of the Daniel Boone National Forest Management Plan.

Cumulative impacts to terrestrial habitats and woodlands in the cities of Somerset and London are generally less predictable. Continuing residential, commercial, industrial and roadway development in these areas, which is expected to occur whether or not the project is constructed, is likely to result in some level of terrestrial habitat and woodland impacts. However, cumulative impacts to these resources in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Threatened and Endangered Species

According to the project terrestrial and aquatic base study (HMB, February 2005), ten species with Federal and State-listed status and their potential habitats were identified from the project area during field surveys conducted for this project. They include: northern white cedar, *Thuja occidentalis*, white walnut, *Juglans cinerea*, Tennessee clubshell, *Pleurobema oviforme*, fluted kidneyshell, *Ptychobranchus subtentum*, Cumberlandian combshell, *Epioblasma brevidens*, ashy darter, *Etheostoma cinereum*, bald eagle, *Haliaeetus leucocephalus*, Rafinesque's big-eared bat, *Corynorhinus rafinesquii*, gray bat, *Myotis grisescens* , and small-footed bat, *Myotis leibii*). Seven species with State-listed status were also identified during field surveys conducted for this project, and they include: Eelgrass, *Vallisneria americana*, Southern maidenhair-fern, *Adiantum capillus-veneris*, Punctate coil, *Helicodiscus punctatellus*, Appalachian cave crayfish, *Orconectes australis packardi*, Sharp-shinned hawk, *Accipiter striatus*, Great blue heron, *Ardea herodias*, and Evening bat, *Nycticeius humeralis*. In addition to the 17 Federal and State-listed species encountered during field surveys conducted for this project, 54 other Federal and State-listed species are known from or have suitable habitat in the project area (HMB, February 2005). However, because this project is still in the early stages of development, it is expected that potential impacts to Federal and State-listed species and preferred habitats can be avoided and/or minimized as alternatives for this project are further developed and the alignments defined. Also, impacts to a number of Federal and State-listed species and preferred habitats in the project area are considered to be mitigable. Mitigation options, and any protection measures for individual species as outlined in agency information request response letters, will be evaluated and addressed once a Build Alternative is selected for further development. Additional information concerning mitigation options for impacts to threatened and endangered species and preferred habitats is detailed in chapter 5 and the project *Terrestrial and Aquatic Ecological Baseline Report* (HMB, February 2005).

Past actions involving roadway construction, scattered single family residential and farm property development, logging, and to a lesser extent, mining, have resulted in either the removal of some preferred habitat or the degradation of some preferred habitat for these species. At this time, it is not known to what extent the combined effects of past (and present) actions have directly impacted the vitality of any of the 71 listed species currently known from the project area.

Reasonably foreseeable future actions/development as a result of the project, which is expected to be limited and primarily concentrated at proposed interchange locations, and other development not associated with the project, will likely result in some additional loss of habitat for Federal and State-listed species. Reasonably foreseeable future impacts to Federal and State-listed species and preferred habitats are not quantifiable, but could include such impacts as limited amounts of woodland clearing and karst opening disturbances from scattered single family residential and farm property development, logging, limited and minor commercial development, and to a much lesser extent, surface and underground aggregate mines (quarries). Impacts to preferred habitats for listed species in the project area are not expected to be notable because any development that occurs is expected to be limited, minor and concentrated around proposed interchange locations for reasons outlined in Section 7.2.2 (subsection 3). Within the Daniel Boone National Forest, reasonably foreseeable future impacts to Federal and State-listed species and preferred habitats in the project area are expected to be less due to a number of additional protection measures afforded listed species within the boundaries of the National Forest, and a number of controls implemented to prevent the disturbance of preferred habitats or quality of those habitats as outlined in the *Land and Resource Management Plan for the Daniel Boone National Forest* (USFS, April 2004).

Cumulative impacts to Federal and State-listed species in the cities of Somerset and London are generally less predictable. Continuing residential, commercial, industrial and roadway development in these areas, which is expected to occur whether or not the project is constructed, is likely to result in some level of threatened and endangered species habitat impacts. However, cumulative impacts to listed species in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Residential/Commercial Displacements and Property Impacts

The proposed project is expected to result in between 14 and 44 residential relocations in Pulaski County, and between 38 and 107 residential relocations in Laurel County, depending on the Build Alternative and alignment details. The proposed project is also expected to result in up to five business relocations in Pulaski County and up to one business relocation in Laurel County, depending on the Build Alternative and alignment. However, because this project is still in the early stages of development, it is expected that potential impacts to residential and business locations and property can be avoided and/or minimized as alternatives for this project are further developed and the alignments defined. Impacts to residential and business locations requiring relocations are considered to be mitigable. All relocation procedures will be accomplished in accordance with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970, as amended, and relocation resources will be made available to all relocatees without discrimination. Additional mitigation measures are further discussed in chapter 5 and the project *Socioeconomic Impact Analysis* (HMB, October 2004).

Reasonably foreseeable future actions/development as a result of the project, which is expected to be limited and primarily concentrated at proposed interchange locations, and other development not associated with the project are not likely to result in additional impacts to residential and business locations, due primarily to the currently isolated and sparsely populated nature of the area encompassed by the proposed project. Because about half of the project is located within the boundaries of the Daniel Boone National Forest, in which development (particularly roadway development) cannot occur, and based on a review of the Kentucky Transportation Cabinet's *Statewide Transportation Improvement Program (STIP) FY 2005-2007* and the *Statewide Transportation Plan, 2005-2018 Long Range Highway Plan Element*, no new highway facilities are currently planned or expected in the project area. As a result, no other present or future actions are foreseeable which would be expected to result in additional relocation impacts or property acquisitions/conversions. In fact, residential and commercial development may benefit as a result of the project, however, this development is not expected to be substantial, but limited and primarily concentrated at proposed interchange locations.

Cumulative impacts to residential and business locations and property in the cities of Somerset and London are generally less predictable. Continuing residential, commercial, industrial and roadway development in these areas, which is expected to occur whether or not the project is constructed, is likely to result in some level of relocation impacts. It is more likely, though, that any relocation impacts will be offset by new residential and business location opportunities. However, cumulative impacts to these resources in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Farmland

According to the terrestrial and aquatic base study (HMB, February 2005), the proposed project, regardless of alternative, will impact approximately between 206.7 and 403.1 acres of farmland (mostly pastureland). While this impact is locally notable, when considering the limited amount of farmland in the project area, it represents only a small fraction (0.07% to 0.13%) of the total 310,459 acres of farmland available in Pulaski and Laurel Counties (USDA, 1997). However, because this project is still in the early stages of development, it is expected that potential impacts to some farmland parcels could be avoided and/or minimized as alternatives for this project are further developed and the alignments defined.

Nearly half of the project occurs within the mapped boundaries of the Daniel Boone National Forest which is comprised of undeveloped, steeply-sloped, secondary growth, young to intermediate-aged woodland. The remainder of the project within Pulaski and Laurel Counties is comprised of an interspersion of secondary growth, young to intermediate-aged woodland and mostly limited amounts of agricultural pasturelands, primarily restricted to adjacent bottomlands, narrow valley bottoms or ridge tops. Based on aerial and map review, coupled with field observations, farmland in the project area encompasses about all of the suitable land available for farming activities.

The primary past actions that have impacted farmland in the project area include roadway construction, and scattered single family residential development. While roadway construction has likely resulted in the conversion of some amount of farmland to public right-of-way, it has also likely resulted in the conversion of some undeveloped or unused lands to farmland, due to the improvement of local and regional access to farmland and farm markets. Other actions, such as mining and logging, are unlikely to have impacted farmland in the project area. However, logging activities may have benefited farmland in the project area to some degree through the creation of new farmland in areas of flat to moderately sloping terrain.

Reasonably foreseeable future actions/development as a result of the project, which is expected to be limited and primarily concentrated at proposed interchange locations, and other development not associated with the project are not expected to substantially impact project area farmland due primarily to the fact that 1) most of the available and suitable farmland in the project area is already in use, 2) according to the Kentucky Transportation Cabinet's *Statewide Transportation Improvement Program (STIP) FY 2005-2007* and the *Statewide Transportation Plan, 2005-2018 Long Range Highway Plan Element*, no new highway facilities are currently planned in the project area that could forseeably cause additional impacts to farmable lands, and 3) portions of the project area (variable depending on the alternative) occur in the Daniel Boone National Forest in which development is restricted.

Cumulative impacts to farmland surrounding the cities of Somerset and London may consist of additional conversion of farmland to residential, commercial and industrial development. However, cumulative impacts to farmland in these areas are not quantifiable due to the limited availability of historic records and land use planning information.

Historic Cultural and Archaeological Resources

According to the project cultural historic survey (Wilbur Smith Associates, March 2005), field observations and research documented the occurrence of twenty five sites eligible for inclusion in the National Register of Historic Places (NRHP). Of these NRHP eligible sites, six are determined to be adversely effected by one or more of the proposed project alternatives, including: Maple Grove School (Adverse Effect from Alternative I), Johnson House on W. Laurel Road (Adverse Effect from Alternatives H and L), Wyan House on W. Laurel Road (Adverse Visual Effect from Alternatives H and L), Buck Creek Bridge (Adverse Effect from Alternatives K, 80 Mod and 80 Shifted), Daryl Whitaker House (Adverse Visual Effect from Alternative 80 Shifted), and Leo Gilliland House (Adverse Visual Effect from Alternative B).

According to the project archaeological survey (Cultural Resource Analysts, Inc, October 2004), field observations and research documented the occurrence of 32 sites eligible for inclusion in the National Register of Historic Places (NRHP). The proposed project is expected to impact between three and eight archaeological sites in Laurel County, and between eight and 17 archaeological sites in Pulaski County, depending on the Build Alternative and alignment. It was recommended that Phase II Archaeological Investigations be performed on all 32 sites.

Because this project is still in the early stages of development, it is expected that potential impacts to historic cultural and archaeological resources could be avoided and/or minimized as alternatives for this project are further developed and the alignments defined. Mitigation measures to lessen potential adverse effects to NRHP historic cultural resources and potential NRHP archaeological resources are further discussed in the project *A Phase IB Report of a Historic Structures Inventory and Cultural Historic Survey for the I-66 Corridor in Pulaski and Laurel Counties, Kentucky Item # 8-59.10* (Wilbur Smith Associates, March 2005), and the project *An Archaeological Survey of the Proposed Construction of I-66 In Laurel and Pulaski Counties, Kentucky* (Cultural Resource Analysts, Inc, October 2004).

Following initial settlement of the project area, the primary past actions that may have affected historic cultural and archaeological resources located in the project vicinity include road construction (KY 80, US 461, KY 692, KY 1003, KY 1675, KY 1956 and feeder roads), residential/commercial development, and agricultural clearing/grazing. Since these actions have taken place over an extended period of time (dating back through the 1800's), it is not possible to quantify the collective effects these actions have had on the cultural resources (historic properties and archaeology sites) in the project area.

Reasonably foreseeable future actions/development as a result of the project, which are expected to be limited and primarily concentrated at proposed interchange locations, and other development not associated with the project along the study corridor may likely result in additional impacts to historic cultural and archaeological resources. Reasonably foreseeable future impacts to these resources are not quantifiable, but could include such impacts as continued farm property development such as clearing and maintenance activities related to grazing and row crop agriculture. While it is reasonable to assume that there has been some incremental impact/degradation to historic cultural and archaeological resources in the project area over time, this incremental impact does not appear to have been critically adverse based on the current land uses and conditions in the project area. Due to the occurrence of the Daniel Boone National Forest throughout about half of the project area a number of these resources have been afforded some protection indirectly due to use limitations and controls implemented on national forest lands.

Cumulative impacts to cultural historic and archaeological resources in and surrounding Somerset and London may consist of additional effects on these resources due to increases of residential, commercial and industrial development. However, due to limited land use planning information, cumulative impacts in these areas are not quantifiable and generally less predictable.

7.3.5 Discussion of Cumulative Benefits

As discussed in Section 7.3.1, the past, present and future actions that have affected, and will continue to affect, environmental resources and features in the I-66 Somerset to London project area include roadway construction, scattered single family residential and farm property development, logging, and to a lesser extent, mining and quarrying, with most development concentrated in and around the cities of Somerset and London (west and east of the project termini). While some of these actions have resulted in loss or modification of the area's environmental resources (and are expected to continue to do so in the future, although not substantially), these actions have also resulted in notable benefits within the I-66 project area, namely economic sustenance and quality-of-life improvements. For example, from an economic standpoint, construction of the current local roadway network, including existing KY 80 and I-75, has improved community and regional connectivity, especially between the cities of Somerset and London. This has contributed to the viability of economic ventures in these cities - from early, predominantly agricultural operations, to commercial and industrial operations. These ventures not only supported the local economy and improved local quality-of-life in and around the cities of Somerset and London, but also provided needed consumer goods that contributed to other regional economies and, ultimately, the quality-of-life in those areas as well.

The transportation improvements proposed for the I-66 Somerset to London project will further improve connectivity in the area by providing better connections to the interstate system. The proposed transportation improvements will also better link the economic centers of Somerset and London, both

locally and regionally, for more efficient movement of goods and services within and through the cities of Somerset and London and other cities. All of these actions are expected to benefit the economies of Somerset and London and the quality-of-life in and around these cities, and are consistent with planned land use outcomes in the City of Somerset, currently the only jurisdiction with a land use plan (personal communication with City of Somerset, City of Somerset Future Land Use Map, April 2004).

Based on the above information, cumulative benefits of the project in conjunction with past, present and reasonably foreseeable future actions in the area, include: 1) economic vitality from linking people to jobs and employment centers, 2) improved recreational opportunities due to better connection to recreational opportunity areas in the project area, and in proximity to the cities of Somerset and London, 3) preservation of natural and cultural resources as limited development is expected in the proposed project area corridor due to the occurrence of about half of the project in the Daniel Boone National Forest, and 4) improved travel and safety.

7.3.6 Conclusions of the Cumulative Impacts Analysis

I-66 Somerset to London

Based on the information presented in this cumulative impact analysis, it is concluded that although past and present actions in the proposed I-66 Somerset to London project area have resulted in some loss or modification to the area's environmental resources, these actions have also resulted in notable benefits within this area. These benefits have played, and will continue to play, an important role in the local economy and overall quality-of-life, especially in and surrounding the established regional economic centers of Somerset and London.

Overall, the I-66 Somerset to London project is not expected to critically affect the condition of resources in the area that have resulted from other past and present actions, or that may result from expected future actions. Direct impacts to resources in the area are expected to be limited to within the project corridor, with indirect impacts concentrated around proposed interchanges and within the cities of Somerset and London located west and east of the project termini.

As described in Section 7.3.3 (Geographical and Temporal Limits of the Analysis), the cumulative impact analysis presented for this I-66 Somerset to London project focuses on the corridor encompassing the eleven proposed Build Alternatives (including proposed interchanges), plus the cities of Somerset and London at the west and east project termini. This study area is determined appropriate for this project in that reasonably foreseeable impacts are expected to be limited to within the project corridor and proposed interchange areas (due to development and access restrictions, rugged terrain, and other factors described in Section II.B.4), and in that this area includes the primary zone of expected benefit and influence of the project, specifically the cities of Somerset and London.

Consideration of Cumulative Impacts Relative to the I-66/Southern Kentucky Corridor

As noted in Section 7.2.2 (subsection 1 Future Conditions), several other segments of the I-66/Southern Kentucky Corridor are under varying degrees of project development, including I-66 between US 23/US 119 south of Pikeville to the King Coal Highway, West Virginia (FHWA approved Record of Decision, 2003; awaiting schedule for final design), and the I-66 Ballard/McCracken Segment and I-66 Warren/Edmonson Segment (both in the early corridor development phases). These planned future projects (schedules not yet determined), along with upgrading sections of existing I-66, will eventually complete the I-66/Southern Kentucky Corridor, tying this west-east facility across the state to key north-south interstates in the area, including I-55 (just across the Missouri line), I-65, I-75 and I-77 (in West Virginia).

Completion of the I-66 corridor through southern Kentucky will enhance regional travel and is expected to contribute to economic development, resulting in quality-of-life benefits, as well as some level of environmental impact associated with the conversion of adjacent land areas to development in this and other parts of the state. Planning studies or other research are not available to make it possible to quantify the amount, type and location of development/land use changes and the associated impacts that would occur as a result of this larger improvement, other than that changes (both impacts and benefits) would be expected to occur gradually over a duration of time as segments of the corridor are completed and beyond. Given the anticipated gradual and long-term nature of these changes, it is anticipated that overall benefits to the region can be realized without an overall or substantial strain on local resources.

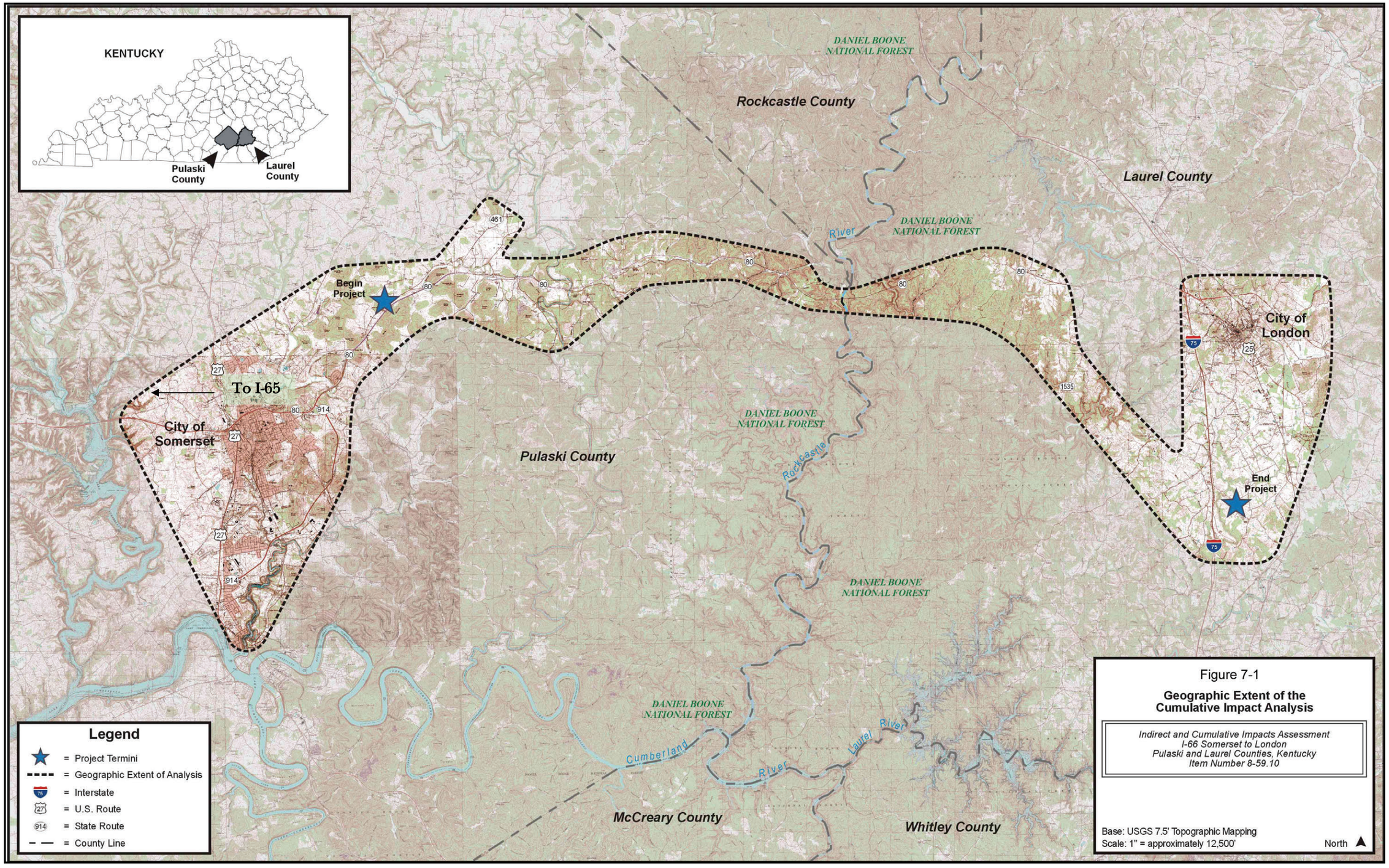

Figure 7-1

Geographic Extent of the Cumulative Impact Analysis

Indirect and Cumulative Impacts Assessment
I-66 Somerset to London
Pulaski and Laurel Counties, Kentucky
Item Number 8-59.10

Base: USGS 7.5' Topographic Mapping
Scale: 1" = approximately 12,500'
North